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OCT 28 1931

ASBESTOS

"Pierre à Coton"



There is no substitute for
Asbestos and if its made of
Asbestos it will not burn.

Asbestos the world's most
important non-metallic mineral.



Reprint of Article
CANADIAN GEOGRAPHICAL JOURNAL

Compliments of
Canadian Asbestos Company

B. MARCUSE, President and General Manager

**FRANKLIN INSTITUTE
PHILADELPHIA**

» Preface «

In presenting a reprint of the article "Pierre a Coton" appearing in the CANADIAN GEOGRAPHICAL JOURNAL, October issue, 1930, we have pleasure in adding thereto data covering the more important Asbestos Mines in Canada.

We originally intended to devote certain space to the names of various Asbestos Manufacturers throughout the world, and we, on several occasions, published a request for information. The response, however, has been so limited, and such little interest has been taken in our offer, that we regretfully advise our many readers we are unable to publish this list. It would be unfair to publish the few names we received and leave out the rest; therefore, we apologize to those who were kind enough to send in their names, and regret they will not be able to participate in a form of publicity which would have cost the manufacturer nothing with a circulation throughout the world.

We hope that the article and the data published herewith will interest our readers.

THE EDITOR.

Montreal,
Canada,

1931

STUART MILLS LTD.
ASBESTOS MFG.

Canasco Products Conserve Energy and Eliminate Waste



The Canadian Asbestos Company, a Canadian Company owned and operated by Canadians, publishes monthly a journal named ASBESTOLOGY. This little magazine contains items of interest to the Asbestos Trade and deals in concise form on the trend of the Canadian Asbestos Industry. It will be sent without charge upon written request.

In December, 1897, the Canadian Asbestos Company was organized to take over a business in asbestos products which at that time flourished at the corner of St. Peter Street and Youville Square (then known as Foundling Street), Montreal, with the object of extending the use of asbestos in every form throughout Canada and developing new uses for this important mineral.

Nearly thirty-five years have passed since then, and most of the founders of the business have passed away, but the Canadian Asbestos Company true to its original purpose has continued to work in the interest of progress by developing the use of asbestos and similar products for the conservation of energy in industry and the elimination of waste in factory and home.

From a small office in Montreal, the Company has grown so that to-day it has offices and warehouses in Montreal, Toronto, Winnipeg and Vancouver, with representatives throughout the Dominion. The Company in later years has also developed an export trade which is rapidly growing.

Catalogues, bulletins and price lists have been issued from time to time as guides to their numerous products and their use. We have lately issued a new catalogue in which all obsolete or antiquated products have been omitted and only the most improved articles for use in industry and home that modern manufacturing methods have made available have been entered. An effort has also been made to give information on the history and development of the different commodities that will, no doubt, prove of interest.

New developments are taking place daily and even before the catalogue left the printing press, something new had, no doubt, become known. Therefore, if there is anything in asbestos or similar products that is not found on the following pages, it is not because we do not have it or do not manufacture it, but rather because it has come too late to be incorporated in our catalogue. We would appreciate it if customers would write us when they do not find what they want. They will receive a prompt and courteous reply.

We thank our many friends who have helped us make our undertaking the success it is to-day, and hope that our continued service will merit good will and continued patronage in the future. If our readers have not received our catalogue, one will be cheerfully sent upon request.

CANADIAN ASBESTOS COMPANY.



316-322 Youville Square - 145 St. Peter Street
MONTREAL

**Head Office of Canadian Asbestos Company
For Thirty-five Years**

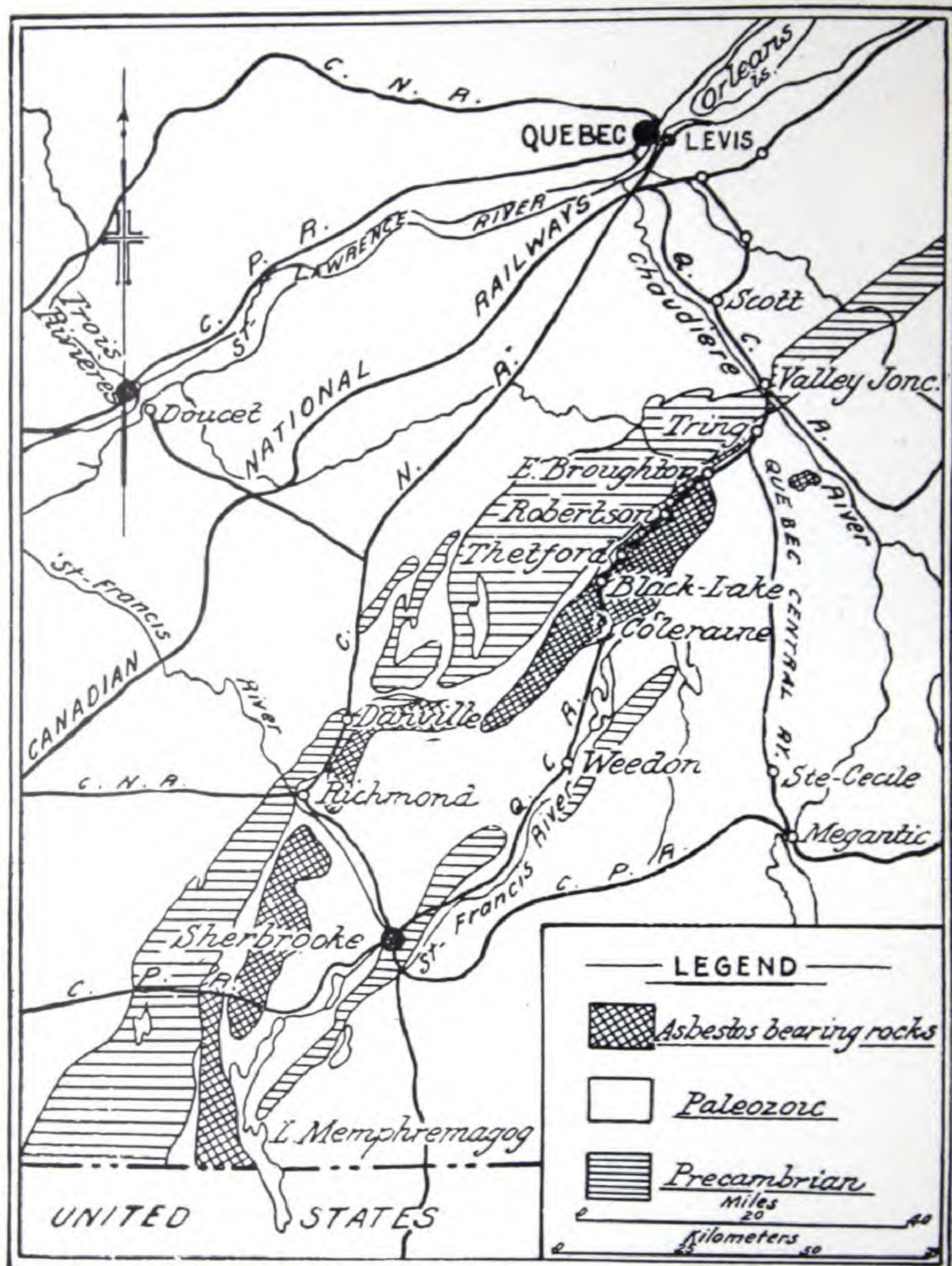


B. MARCUSE
President and General Manager

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From "Asbestos Mining and Milling" by Capt. J. G. Ross.

Sketch map of the "Serpentine Belt," Quebec, in which occur the deposits of asbestos.

Asbestos—"Pierre à Coton"

By B. MARCUSE

AMONGST the early French settlers in the Province of Quebec, asbestos was called "Pierre à Coton" (The Cotton Stone). This name was used because the stone appeared to them as a stone of cotton, and in some respects they were right.

The appearance and quality of asbestos justify in many ways the nickname given to it by the inhabitants because whilst it looks like stone, it can be woven like cotton and wool, and in its natural state it even looks like spun glass. It is smooth and silky to the touch, and possesses at the same time great tensile strength.

Occupying the position of a connecting link between the animal, vegetable and mineral kingdoms, it possesses some of the characteristics of all three. Whilst in appearance as light, buoyant and feathery as thistle-down, it is, in its crude state, as dense and heavy as the solid rock in which it is found. Seemingly as perishable as glass, it is yet older than any order of animal or vegetable life on earth. So little, indeed, is it affected by the dissolving influences of time that the action of innumerable centuries, by which the hardest rocks known to geologists are worn away, has had no perceptible effect on the asbestos found embedded in them. Whilst the greater portion of its bulk is composed of the roughest and most gritty materials known, it is really as smooth to the touch as soap or oil. Apparently as combustible as tow, the fiercest heat cannot consume it, and no combination of acids

will affect the appearance and strength of its fibre, even after days of exposure to their actions.

It is not affected by heat, cold or dampness. It possesses two properties which are not found combined in any other substance. It is textile and it is incombustible. It is a perfect non-conductor of electricity. Hundreds of millions of dollars have been invested throughout the world in the mining and manufacturing of it. Over \$10,000,000 in value of the raw material alone is exported from the Province of Quebec every year, and when it is remembered that less than a century ago asbestos was practically unknown, it is not unreasonable to assume that within the next hundred years the asbestos industry will make still greater strides and become one of the most important industries.

The name asbestos is derived from the Greek, and signifies unquenchable or unconsumable. The early Romans obtained their supplies of asbestos from the Italian Alps and from the Ural mountains in Russia.

When asbestos was first discovered it was considered to be of vegetable origin, probably because of its silky appearance and unctuous feel. Specimens of woven

asbestos made in the days of the Romans are on exhibit at the Vatican, and these specimens contain a certain percentage of vegetable fibre intermixed with the raw asbestos. The same practice is still carried on nowadays by adding cotton, although the finer grades of asbestos, known as chemically pure



B. MARCUSE

was born in Montreal in 1882, son of Berthold Marcuse, one of the pioneers in the asbestos industry, and has himself been intimately connected with the industry since 1900, at which time he joined the Canadian Asbestos Company. In 1907 he became associated with the Amalgamated Asbestos Corporation, predecessor to the Asbestos Corporation of Canada, now Asbestos Corporation Limited, as general sales manager, and during the next 20 years held various other important posts within the industry. In 1927 he purchased the Canadian Asbestos Company, of which he is now President and General Manager. He was educated in the public schools of Montreal and at Bishop's College School, Lennoxville, has travelled extensively, and is probably one of the best-known figures in the asbestos business.

Acknowledgement is made to the officials of the Asbestos Corporation, Canadian Johns-Manville Company, Johnson's Company, Bell's Asbestos Mines, Nicolet Asbestos Company and Quebec Asbestos Corporation, for co-operation with the author, the Managing Editor of the Journal and the Journal photographer, in the securing of the textual and photographic material for this article during a special tour of the asbestos region.

ASBESTOS—"PIERRE à COTON"



Royal Canadian Air Force photographs.

Above is an aerial view of the town of Thetford Mines and vicinity, showing several mines and the huge dumps of refuse.

Below is an aerial view of the Canadian Johns-Manville mine at Asbestos, with the mine to the right and the refuse dump, the immense grey object in the foreground. This refuse dump containing the useless part of the Asbestos rock, constitutes a problem in itself, involving as it does heavy expenditures in haulage and territory.



grades, are made of the pure crude asbestos showing that it is not necessary to add anything to the mineral.

When Marco Polo was travelling through Siberia in the 13th century he was shown some cloth which resisted the action of fire, and he found that it was made of a fibrous material called "Amianthus". This material probably came from the Island of Cyprus. The word "Amianthus" is really a translation for asbestos.

The early history of asbestos states that Charlemagne used table cloths

of mechanical methods for the preparing of this product of inorganic nature have gone ahead apace.

Various kinds of asbestos are found. Each country in which it is found produces a different variety. However, the two most important classes are known as chrysotile and amphibole, the first-mentioned having considerable tensile strength and therefore adapted for textile purposes, whereas most grades of amphibole cannot be spun. As stated, asbestos is never precisely alike in any two places. This is best illustrated



Specimens about half actual size of crude asbestos of the finest grade. The fibres are easily discernible.

made of asbestos, and to amuse his guests threw them into the open fireplace and afterwards took them out, thereby mystifying his company through the fact that they had not been destroyed.

From this early history it is apparent that this peculiar non-combustible and spinnable material was recognized as having some value, and whereas early attempts to use asbestos commercially were made from time to time, it was not until the middle of the 19th century that asbestos came into its own. Since then the exploitation and development

by the collection on exhibit in the author's office, consisting of more than 500 different specimens. Then again, the colour varies—it is found in all shades and hues, in all lengths, and changes from the early "Mountain Leather" and "Crystals" to the finer silky threads which can be spun into yarns which weigh less than an ounce per 750 feet, and possess great tensile strength.

Many people wonder just how the fibres are separated so that the various lengths are brought together. A technical book would be required to go into

ASBESTOS—"PIERRE à COTON"



A panoramic view of the vast amphitheatre of the Canadian Johns-Manville mine at Asbestos, which covers an area of 50 acres. It is a shallow mine, and constantly extends as the terraces are cut further back into the rock. Portable railway tracks are laid along the terraces, and dump trains move the broken rock from terrace to mill. When a new terrace is blasted the tracks are moved into the "face". A machine called a "track mover" is gripped to a length of track and in a few minutes it moves the track to the new position, lifting it about two feet at a time, ties and all. In the dim distance, near the centre, is seen a church steeple, a land-mark of the village of Asbestos, which is on the edge of the mine and is gradually being pushed





further away by the growth of the mine in its direction. Below is the Asbestos Corporation pit at Thetford Mines. It is a deep mine, being 450 feet from the surface, with the sides rising steeply. The method of moving rock from the working "face" here is by "scoops" which are first hoisted vertically to cable-ways, and then drawn horizontally along the cables to the cable stations, from which dump trucks take it to the mills. This is the greatest cable-way system in the world having a length of 1,400 feet between derricks, and being capable of lifting over 7,000 tons of rock every working day. The Bell pit is seen in the distance.





A close view of a section of the serpentine asbestos rock showing the asbestos veins in their natural state at the Bell mine.

these details, but in a few words it might be stated that the entire process is a mechanical one and that the main operation takes place in machines known as collectors and graders. Asbestos is sold by the ton, and the price is based on the length of the fibre; therefore, a machine had to be devised whereby the producer could test his fibres and whereby the buyer would know he was getting the correct grade or quality, consequently, a shaking machine was invented. This machine consists of four boxes on top of one another—each box has a different screen with a different mesh and gauge. One pound of the asbestos fibre is placed in the top box and the machine is allowed to run for two minutes at 300 revolutions per minute. The machine being built with a $\frac{3}{4}$ eccentric gives it a shaking motion. After the machine has run for two minutes, it is opened and the residue on each screen at the bottom

of each box is weighed. The more fibre found in the top or first box where the screen is widest, the better and more valuable the grade, and this process is continued until such grades as only show a residue in the bottom and second box are obtained and sold as the lower grades.

The combination of figures obtained on each box added together will always give the sum of 16 ounces, so that what is commonly known as spinning fibre might test 4 ounces on the first box, 7 ounces on the second box, 4 ounces on the third box and 1 ounce on the bottom, whereas a short fibre tests nothing on the first and second box, 5 ounces on the third, and 11 ounces on the bottom box. Other combinations always total 16 ounces.

Asbestos is widely distributed and found in many countries, but as already stated, every country produces a diff-

erent type or kind. Some of the most important countries, outside of Canada, in which asbestos is found, are Rhodesia and Cape Colony in South Africa, in Russia, Vermont and Arizona in the United States, the Island of Cyprus, Corsica, Australia, the Italian Alps, Finland and South America. However, asbestos is not found in commercial quantities except in few places.

To-day the finer grades of asbestos are used for making asbestos textiles. These textiles are again turned into various articles of commerce. Probably the largest use for asbestos is for making yarns for brake-band lining. Every car is equipped with asbestos brake lining. The best brake lining for automobiles is made of the long grades of Canadian fibres and crudes. One cannot visit a theatre without seeing an asbestos theatre curtain. Asbestos is used for

filtering acids, insulation, such as boiler and pipe covering, fire-proofing, packings, millboard and asbestos paper. Asbestos roofing manufacturers and the paint trades use it to a large extent as a base. Artificial floors are sometimes made of it.

Some other uses of asbestos are for:—acoustical plaster; brake-bands for wheels and discs; boards; boiler coverings; boots; brushes for corrosive liquids; fireproof clothing; cork and asbestos mixtures; covering for radiators; corrugated paper and sheets; door-sills and frames; electrical insulation switch-board and boxes, handles, cords, cables, covering for wires, vulcanized materials; felt and wool covering; filters; fire extinguishing mixtures; flat-irons (handles and stands); heating plates; floors; insulation in film industries; insulating material for boilers and steam pipes; insulation of refrigerators; lining for



In this mine at Nicolet all the rock is drawn from the face of the pit on a track operated by a cable.



This illustrates drillers at work on perpendicular holes. In the foreground are seen plugs in the holes ready to be charged for blasting as soon as the whole series is completed, they are set off simultaneously.



These drillers are preparing the holes for charges of dynamite, in this case they are being drilled horizontally.



The explosion showing the upheaval of asbestos-bearing rock caught by the camera at the moment of the blast.



After the blast has taken place. The rock is now in condition to be lifted by powerful shovels and transferred to dump cars, which in turn transfer it to the mills. Note the size of some of the pieces which will go into the crushing machines later.



An electric power shovel loading a train of cars with serpentine rock after blasting in the Canadian Johns-Manville mine.



Men at work in the open mine "cobbing" and separating the finest grades of asbestos from the rock after blasting and prior to shipment to the mill. All manner of mechanical contrivances are used in the asbestos industry, yet it has been found profitable to have hand labour search for the higher and larger veins of crude asbestos and to separate them from the less valuable grades which are passed through the mills

furnaces (in factories and homes drying rooms, baking ovens); magnesia pipe insulation; mattresses; packing material (counteracting chemical agents, dry and wet heat, high pressure steam, for pumps, air brakes, etc.); painting materials and colours; paper; paste and cement for building material; plaster for walls and ceilings; road-building material; roofing materials (slate and tiles); sound-proofing material; textiles (clothing, draperies, covers, rugs, tablecloths, etc., tarpaulins, theatrical decorations, mats, belts); wall hangings; wall paper; waterproofing with impregnated asbestos; wicks and torches; artificial wood.

The first discovery in Canada was in the early sixties of the last century when a deposit of silky-fibred stone, so-called, was found in the Province of Quebec. A sample of this was sent to London for exhibition purposes, and later on other vast deposits were discovered from which Thetford, Black Lake and Asbestos, near Danville, developed. These now constitute the world's greatest reserves of Chrysotile asbestos. Mining operations were started in the Province of Quebec around 1878, but at that time only the better grades of crude were used. Today, however, all grades are used, and the biggest bulk of the production in the Province of Quebec is what is known as fibres of the grades used for shingle and paper-making, besides which, of

course, the better grades for spinning and the lower grades for insulation are also found.

On a map of the Province of Quebec you will see the names of Danville, Asbestos, Black Lake, Thetford Mines and East Broughton. At and close by these places are all the asbestos mines of the region. The busy little towns in and around which there are a number of mines, are peculiarly asbestos mining towns. They owe practically their whole existence and their population to the presence of the mines.

The asbestos region of Quebec may be really divided into three areas—the Danville district, where the Canadian Johns-Manville Corporation has opened up a vast deposit; the Thetford and Black Lake district, where companies such as the Asbestos Corporation, Bell Asbestos Mines and the Johnson Company are situated; and the East Broughton district, where the Quebec Asbestos Cor-

poration is the chief operator. Queer to relate, each district produces a different class of asbestos. Danville is known as a milling district, and less crude asbestos is found there than at Thetford. Thetford is recognized as being the district from which the finest crudes and spinning fibres in the world are obtained, and at Broughton the better class of the shorter grades are produced. Black Lake is known for its shingle stock.

The properties of the Canadian Johns-Manville Corporation are situated at the village of Asbestos, five miles from Danville. Crude asbestos was first removed from the present mine of the Company in 1887. It was originally called the "Jeffery Asbestos Mine" as it was located by W. H. Jeffery. Upon the death of Mr. Jeffery in 1894, the property was bequeathed to William Farwell and Frank C. Thompson, who sold it in 1895 to Messrs. Boas, Greenshields and Marcus (the last-named being father of the



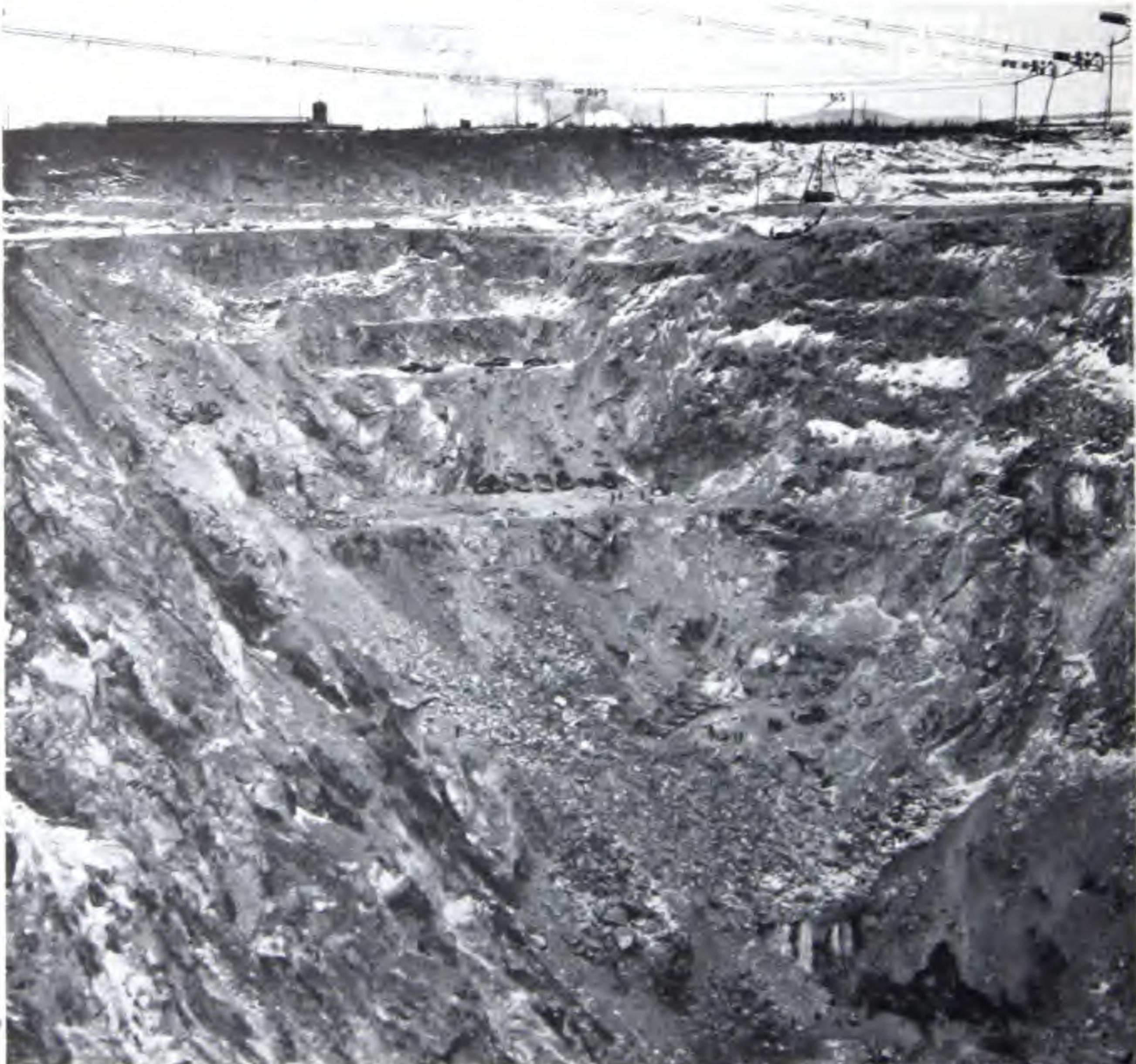
At the Quebec Asbestos Corporation mine at East Broughton the dump cars, handled by an electric locomotive, bring the broken rock from the various "faces" to a covered cable-way system which draws the cars to the surface and dumps their contents into the crushers. On the top of the pit at the left will be seen an electric shovel which is digging the top soil from the rock prior to the coming of the drillers to dynamite the rock underneath.

author). These men organized the Danville Asbestos and Slate Company, which was bought out in 1897 by the Asbestos and Asbestic Co., Ltd. The latter company went into liquidation in 1916, and the property was purchased by the Manville Asbestos Company, Limited.

In 1918, the Manville Company transferred all properties to the Canadian Johns-Manville Co., Ltd. This property has since been greatly developed and now forms the largest single source of supply for commercial asbestos in the world. What was formerly a comparatively small hole in the ground is to-day a vast pit, 50 acres in area. One sees a tremendous hole in the ground—but what a hole! In it is being waged a mighty and continuous battle with Nature to wrest the fibre-bearing rock

from her stubborn grip. Here we have great electric shovels, older craft in the form of huge steam-shovels, while gasoline-powered shovels are used for lighter duty.

Auxiliary equipment includes electric locomotives, steam locomotives, dump cars, service cars, box cars, telephones, signals, power lines, air lines, water lines and batteries of search-lights. At night, the bowl of the pit is illuminated by powerful electric lights and the loading out of materials proceeds as in the day-time—dirt and waste rock to the dumps, ore to the mills. At times it is a battle with the elements also. Rain or Shine, Summer or Winter, the work continues. Storms and heavy snows require the concentration of all forces at threatened points. Lines of communication must



A near view of the King pit of the Asbestos Corporation Ltd. at Thetford Mines showing terrace workings, a scoop in operation on a cable-way, and giving an idea of the depth of this immense hole. The tiny black figures, almost indiscernible, near to about centre-right of the photograph are mine workers.



The "face" of the asbestos-bearing rock in the mine of the Quebec Asbestos Corporation at East Broughton.

be kept open. Transportation must be kept moving. For this is an open-pit operation, with all that it implies.

Ahead of actual operations, go the prospect drillers, sinking their diamond or shot drills deep into the ground to obtain information. Maps are made and a plan of campaign drawn up. Power shovels clean the dirt, or over-burden, from the rock surface. The rock drillers sink their holes into the rock and the holes are then loaded with explosives and blasted. Then come the big power shovels, tracks are run in, and the cars loaded, shunted around by small locomotives, and later picked up in trains by hauling locomotives and taken out.

The operations require an enormous amount of auxiliary service. Operations are forever on the move. Compressed air lines for drilling must be taken up and relocated. The same thing applies to pumps, power lines, railway tracks,

telephone lines and many other items. All equipment is subjected to "heavy duty" with the necessity of constant inspection and repair.

With the electrification of the mining operations, the pit has taken on a vastly different appearance. Power transmission lines now run everywhere. Poles of varying heights and weights, together with the portable steel towers, are in evidence all over this pit.

At Asbestos the Canadian Johns-Manville Company mines employ a somewhat different method to other properties, using what is known as open cast work. After blasting the rock, the material is picked up by huge steam-shovels and loaded into large gondola cars. These cars are drawn directly from the quarry up to the mill and the rocks dumped into a large bin, from which they pass into the crushers. These crushers are direct motor driven and will take a rock



A close-up view at two of the cable-way stations on the King property of the Asbestos Corporation at Thetford Mines. Some conception of the size and extent of the system is gained from this intimate view of a detail of it.



In olden days, the French-Canadian women in the asbestos region were fully aware of the facility of spinning and weaving asbestos fibres and made many articles of clothing out of them through old-fashioned spinning wheels and looms. A few of the French-Canadian women of to-day still do a little of the spinning on their grandmother's spinning wheels. This is a recent photograph taken in the asbestos region. The woman is carding the asbestos fibre preparatory to spinning it on the wheel.



Specimen showing ribbon structure of asbestos rock and veins of crude of lighter colour than the rest of the rock.

approximately 5 feet x 2 feet x 2 feet, weighing several tons. After going through the primary crusher, the material is again passed through a crusher. From there it is carried by elevator or buckets to the dryers, from the dryer through the mills where the fibres are separated from the rock by air suction, and graded and bagged and otherwise prepared for the market.

Going from Asbestos towards Thetford Mines, on the way is a property operated by the Nicolet Asbestos Company. This property is worthy of mention because it lies between Asbestos and Thetford and thereby proves the continuity of the belt, or band, of asbestos from one district to the other.

From Nicolet we proceed to Black Lake where some of the properties of the

Asbestos Corporation and the Johnson Company are found.

Proceeding from Black Lake to Thetford, we pass the Maple Leaf property of the Asbestos Corporation, and come to what is going to be the most modern asbestos mill in the world. This mill is now being erected by the Johnson Company who are probably the pioneers in the asbestos field, the properties having been operated for many years by the late Andrew Johnson, who may be called the "Father of Asbestos". The method of milling asbestos is best illustrated by this mill, and a number of the photographs deal with the process.

From the Johnson property we proceed to Bell's. Bell's is known as the most productive asbestos mine in the world. A view in the Bell pit shows the actual asbestos veins in place. These veins, or seams, are found between the mother rock, and the better and wider seams are carefully put aside awaiting the cobbing process. The pits have endless stringers or smaller veins, and these are used in the milling process, being too small to break away from the mother rock or matrix. The rock and everything it contains is passed through the mill where the separation takes place.

Mines neighbouring Bell's are those of the Johnson Company and the Asbestos Corporation. A tremendous wall of rock separates the Johnson pit from the Bell pit, and this at a later date, when the Johnson new mill and

quarrying methods have been finished, will be removed. In former years a high wall known as the "Bonne Femme" existed between the Bell and King pit. This wall was dynamited and thousands of tons of rock containing the asbestos were blown into these pits, which in the interval have been disposed of so that the illustration shown on page 8 gives a view of both pits. The King pit is the deepest quarry of them all, being 450 feet at the lowest spot.

The Asbestos Corporation operates King's pit by the greatest cable-way system in existence. Some idea of the magnitude of the operations carried on may be gained by the fact that over 7,000 tons of rock are hoisted daily out of this one pit by cable, and that approximately 15,000 tons of rock are handled every day at the various properties of the Asbestos Corporation. From derrick to derrick there is a span of over 1,400 feet at King's pit.

From Thetford we continue to Broughton, passing such places as Robertson and other small towns where formerly asbestos was mined, and visit the property of the Quebec Asbestos Corporation. This property is owned by the Philip Carey Co. of Cincinnati, who are manufacturers of asbestos goods, so that their raw asbestos requirements are supplied by their own mines. The properties at Danville are owned by the Johns-Manville Company, and

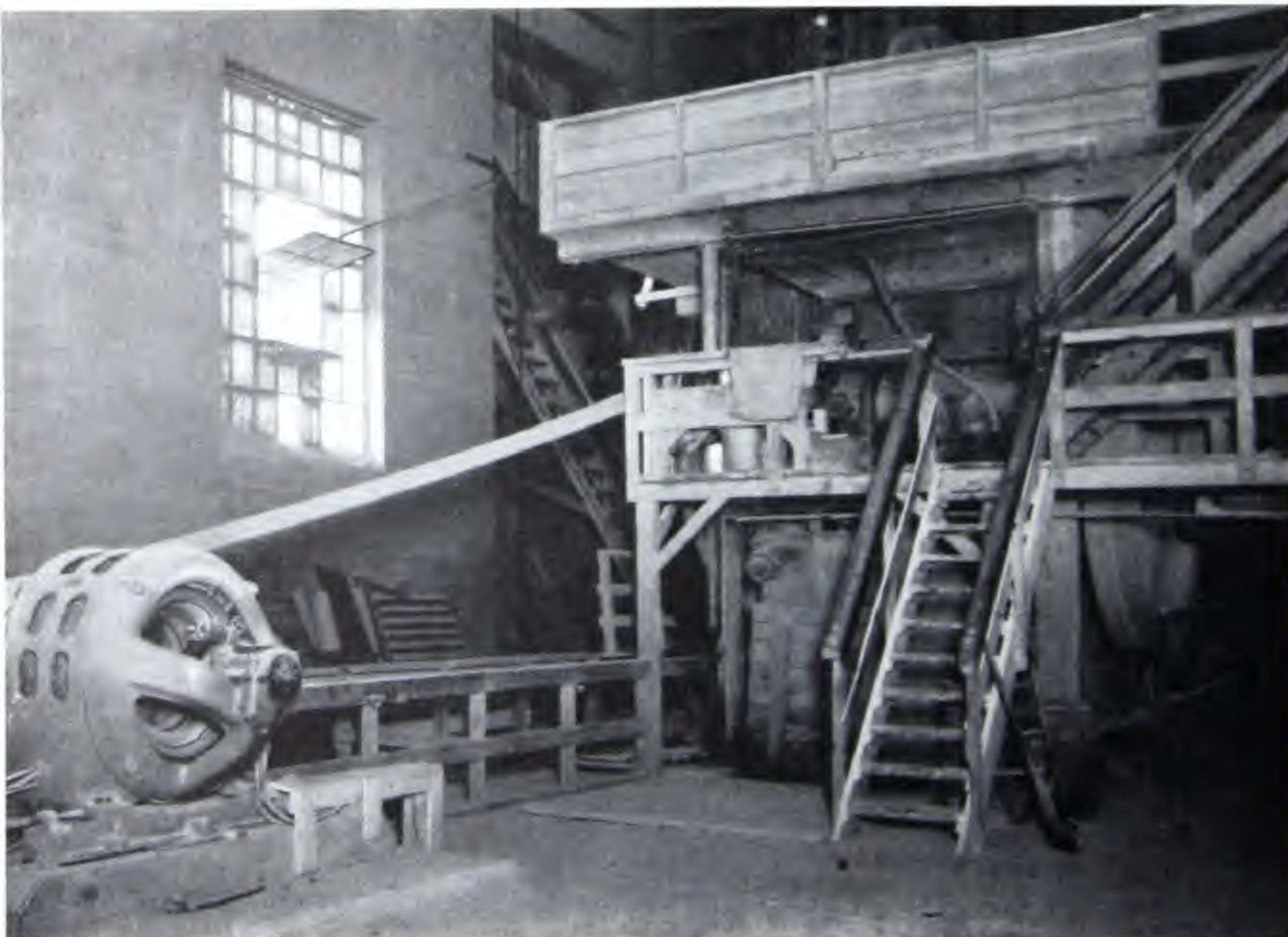
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Asbestos rock, showing veins of crude asbestos facing each other. The veins here shown are illustrative of the most valuable form in which asbestos is found.

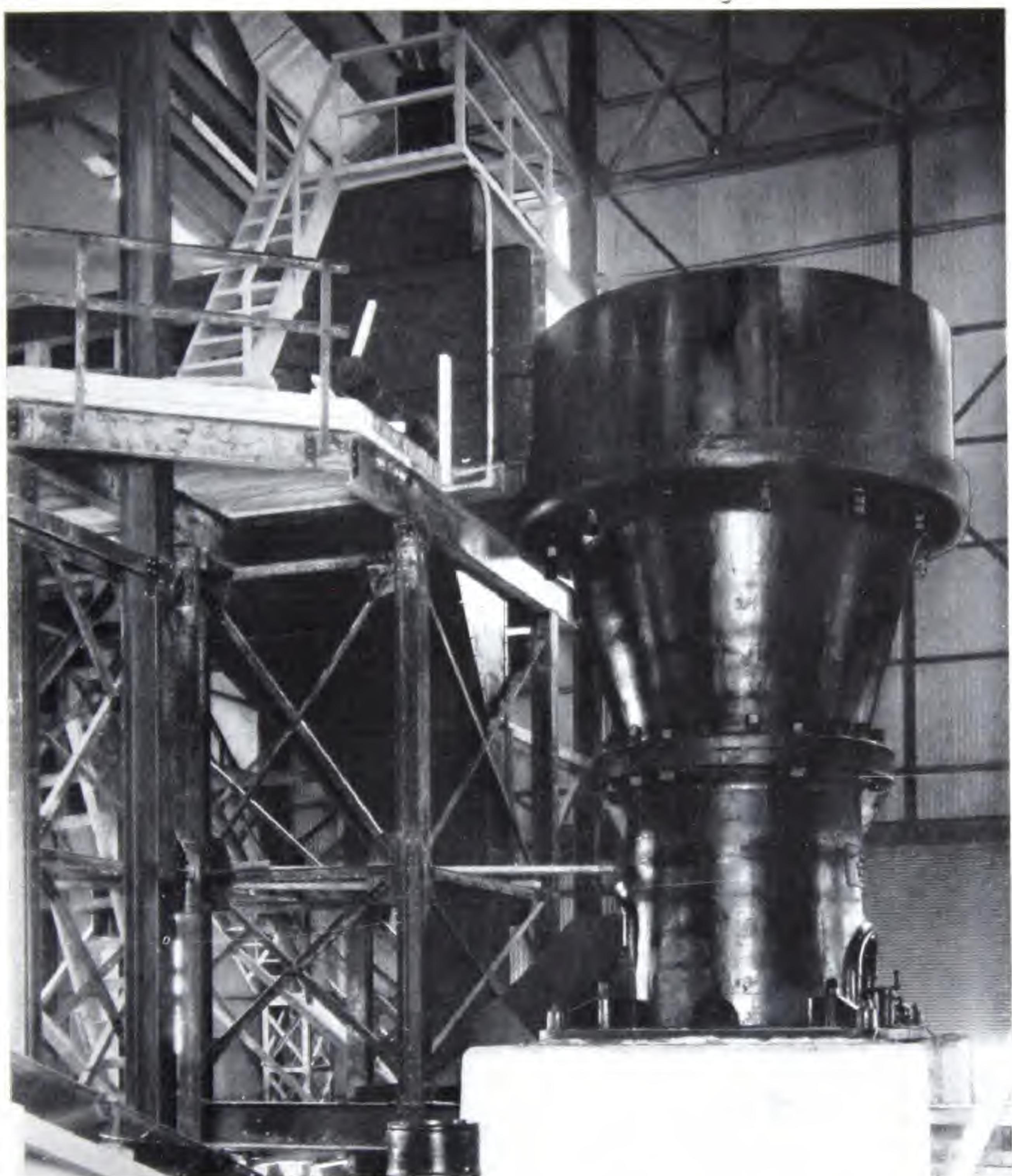




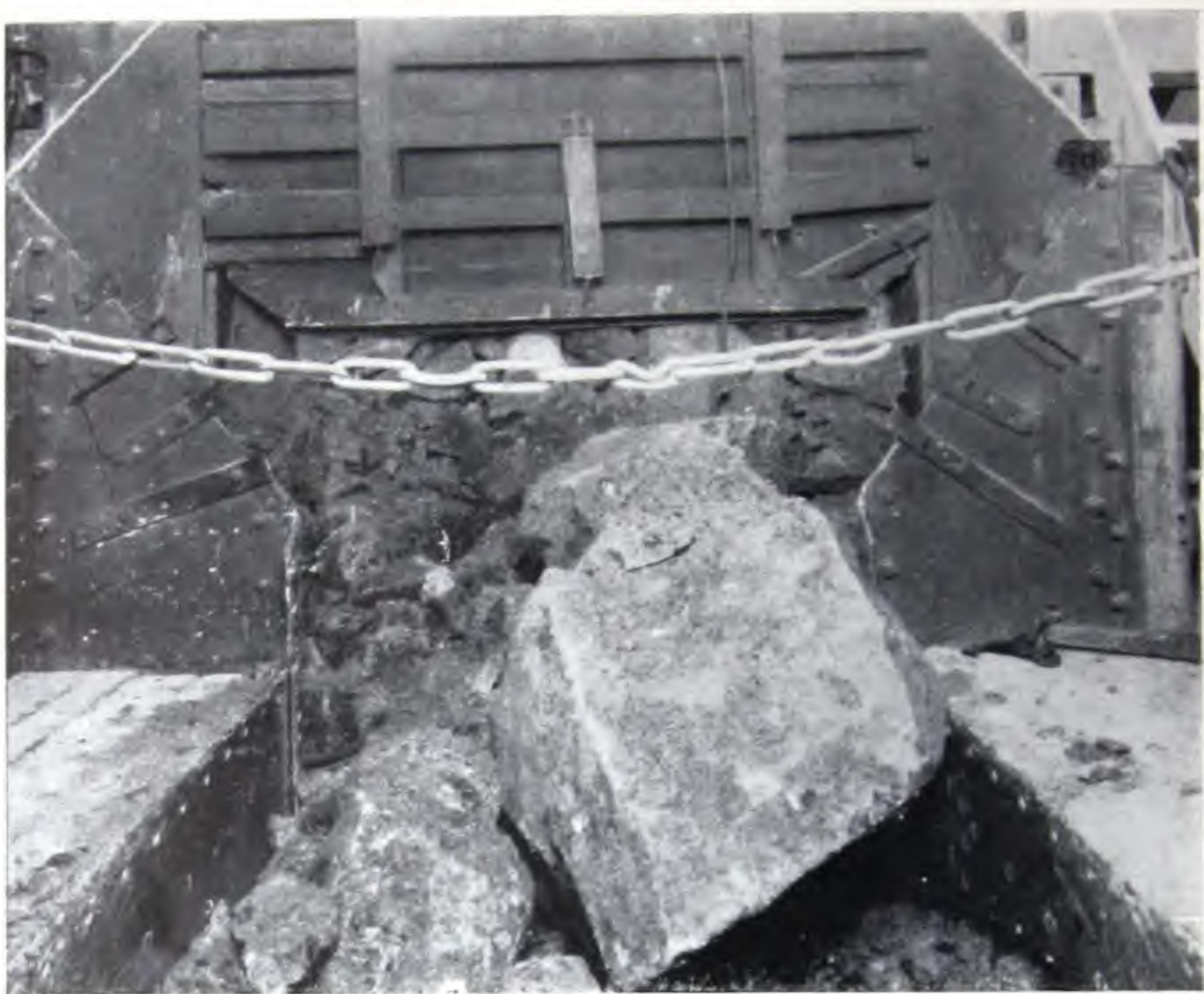
Milling processes and machinery vary somewhat, but this and the succeeding photographs, the majority of which were taken in Johnson's Mill one of the most modern at Thetford Mines, give a fair general idea. Above is a photograph of the new mill referred to.



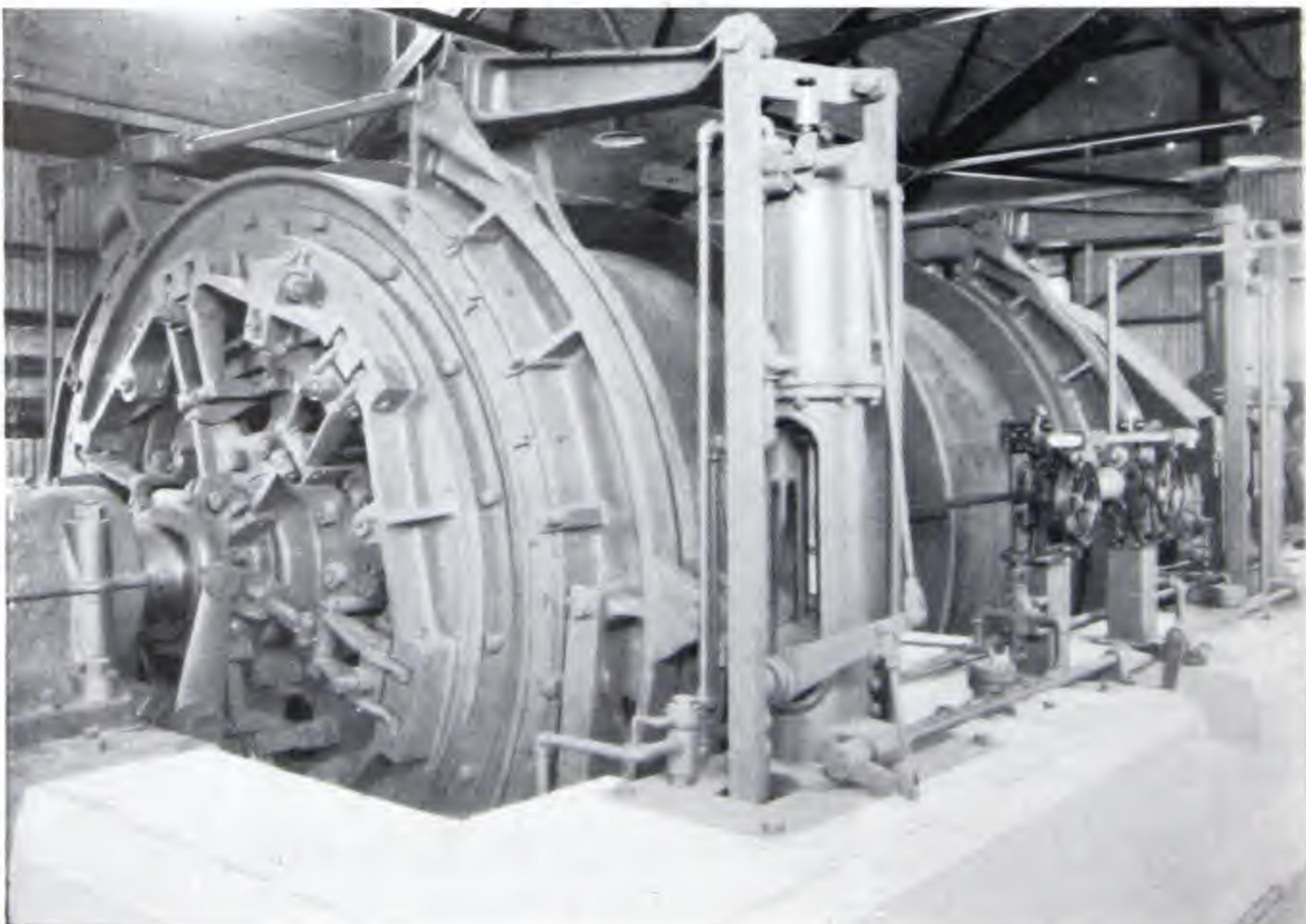
The photograph gives an inadequate impression of the immensity and power of this rock-crushing machine. This particular machine is at the plant of the Canadian Johns-Manville Company. Rocks of all sizes up to tons in weight pass into its invincible jaws, which are in the rear of the stairway.



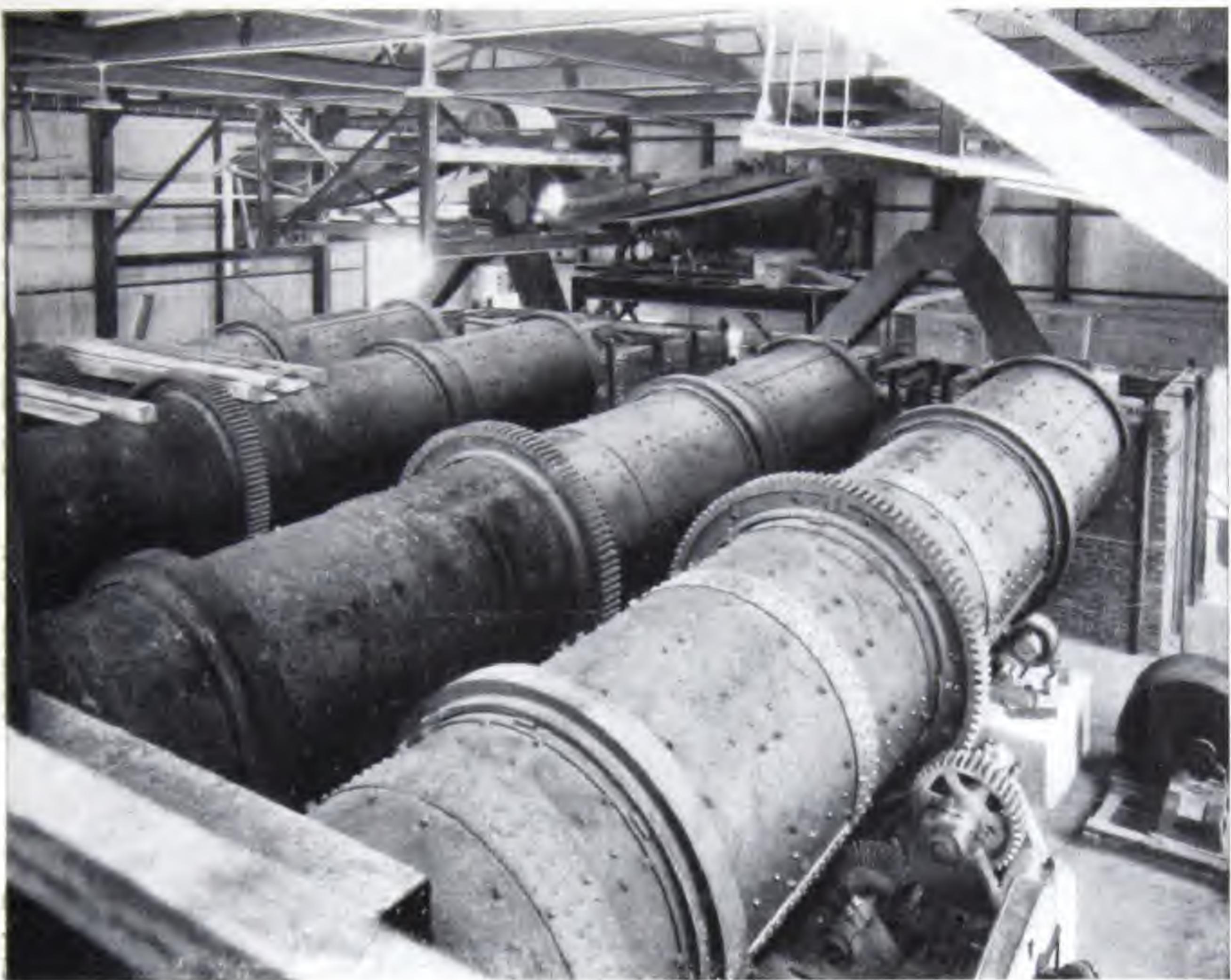
The mined rock is first dumped into the primary crushers, sometimes direct from dump cars and sometimes into bins from which supplies for the crushers are released as required. The primary crushers reduce the rocks to something approaching uniform size. From the primary crusher, the crushed rock travels upwards either on endless belts or buckets to smaller crushers, and from thence to the "drier-house." Above is a primary gyratory crusher, with a capacity of 500 tons per hour. This crusher weighs over 130 tons and requires a 150-horse-power motor to drive it. The previous crusher illustrated is of the "jaw" type, the rock passing between a pair of immense slabs of corrugated steel, one of which is stationary, the other, in constant motion, crushing and squeezing the rock against the stationary slab, this crusher is in the Johnson Mill at Thetford.



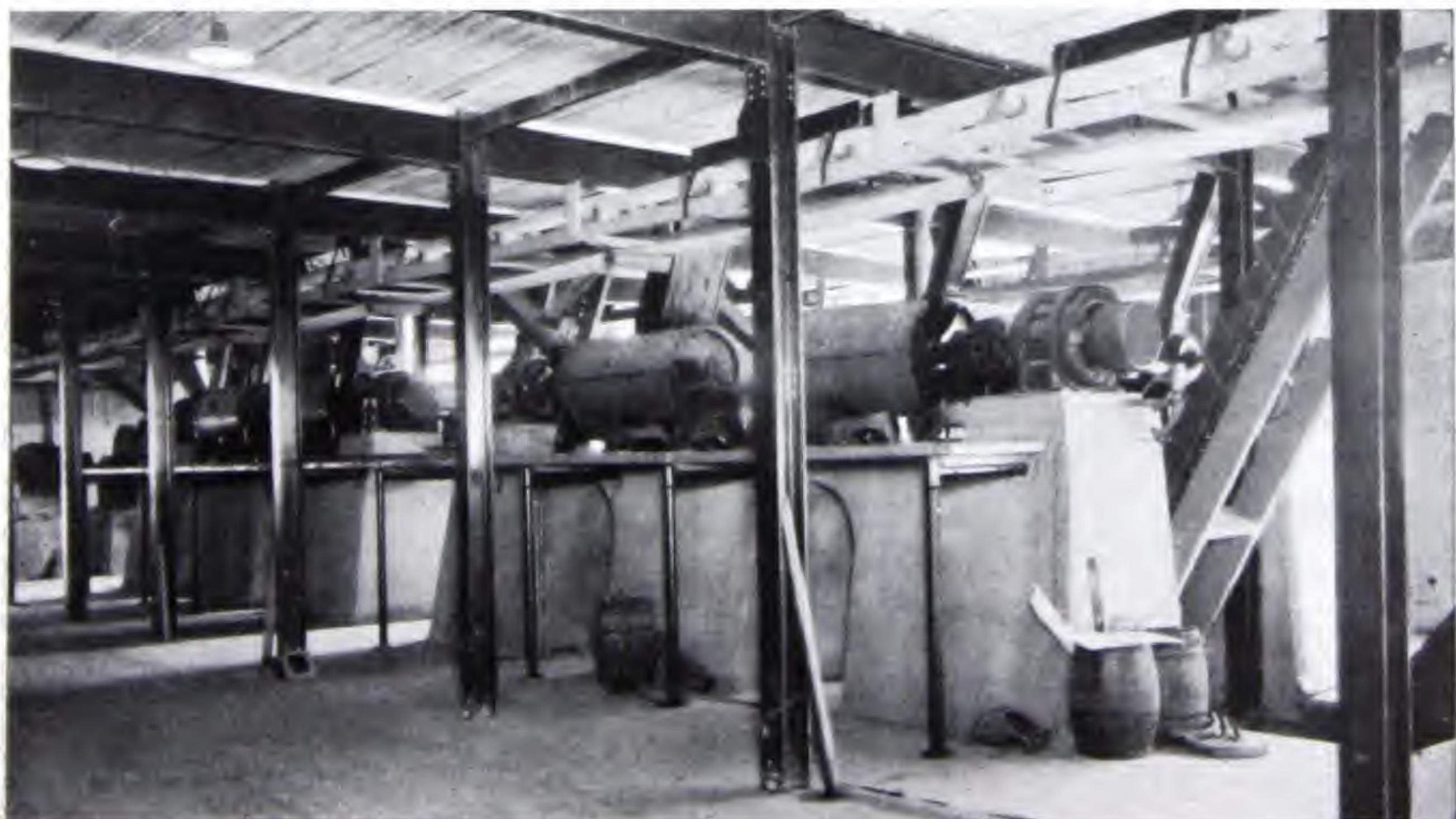
Here is the gateway facing the mouth of the giant crusher of the Canadian Johns-Manville Co., with rocks of all sizes ready to pass through. It was estimated by the engineers on the spot at the time the photograph was taken that the rock in the foreground weighed several tons. In less than a minute it would be ground between the jaws of the crusher to a size used in road surfacing.



A gigantic electric hoist at the Johnson mill, capable of hauling several tons at the rate of 750 feet per minute.



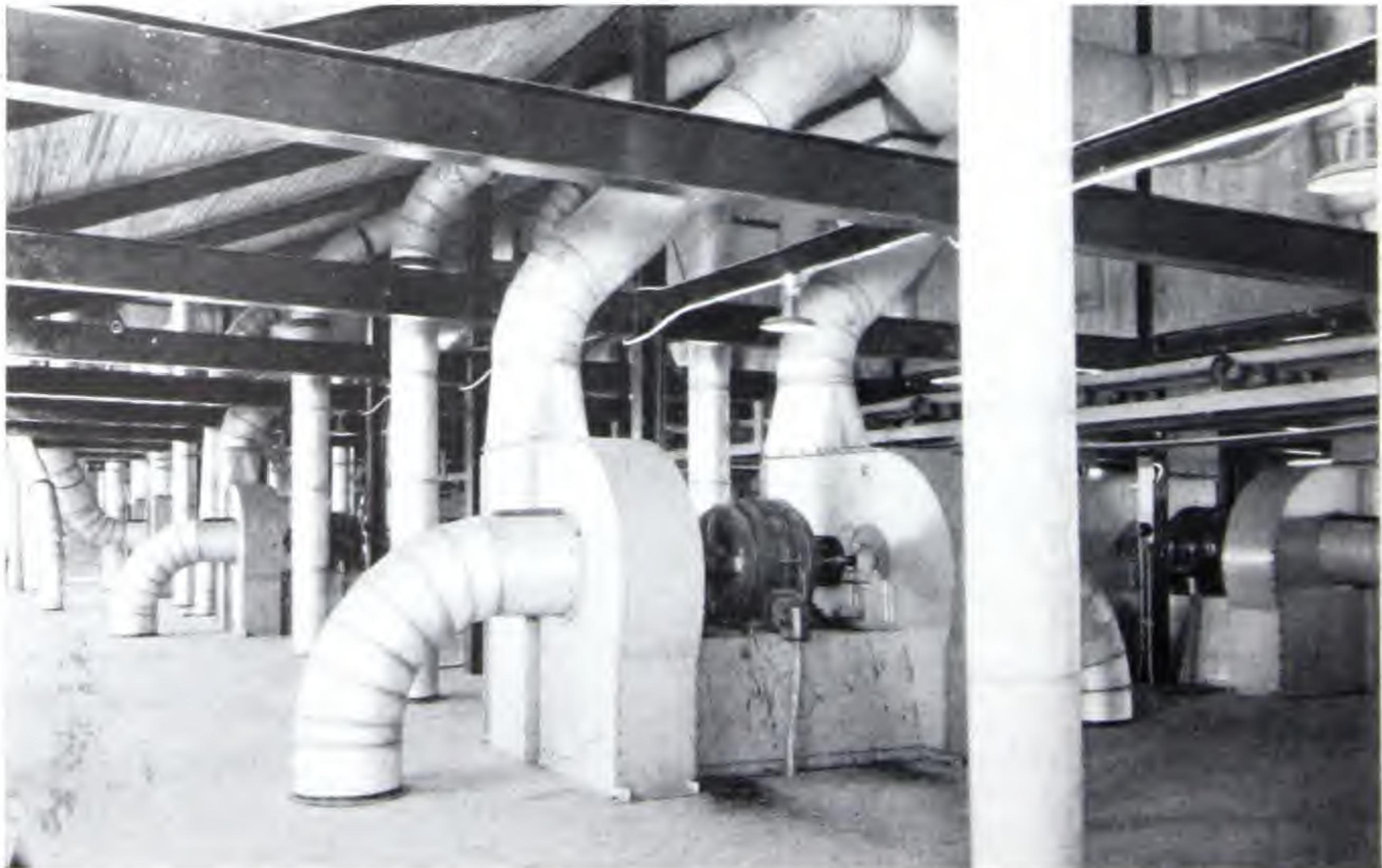
Drying drums at the Johnson mine. After passing through the large rock crushers, the rock being then of about the size of ordinary stove coal, it is passed by conveyors into these huge drums, constantly revolving and heated by powerful furnaces. By the time the broken rock has passed from one end of these heated tubes to the other, and is on its way to other processes, it is thoroughly dry. Unless quite dry asbestos rock is not suited for passing through the various mill processes.



"Jumbos," or machines used for finer crushing of small asbestos rock at the Johnson Mill.



An endless bucket-line conveying crushed rock from the smaller type of crushers to other mill processes.



A blower system, whereby fibres are sucked up before going into the collectors, which grade or sort the various lengths.



A system of shaking screens, conveying asbestos fibre to blower apparatus, which makes separations as to size and quality.



A battery of revolving machines used in separating or grading asbestos fibres.



A storage bin with a capacity of 50,000 tons of crushed rock at the Beaver Mine of the Asbestos Corporation.



Representatives of the feminine sex are rarely seen in or about the mines, mills and other properties of the asbestos companies, but here is an exception in the mine plant on the outskirts of Thetford mines, where a large number of young women are engaged in the process of separating the highest grade asbestos from less valuable grades. The process is known as "cobbing" and the separation is done by means of a small but heavy hammer. The number of bright and healthy-looking French-Canadian girls in this department is always a surprise to visitors. The photograph shows only a section of the cobbing room.



Here is a near view of one of the "cobbers" with the cobbing hammer poised on its way to split the piece of asbestos. On the morning this photograph was taken the young lady had accidentally hit the thumb of her left hand with the hammer, although this sort of accident rarely occurs amongst the workers, who become quite skilled in the wielding of the hammer.



One of the refuse dumps of the Asbestos Corporation. Dumps of this sort are scattered all over the asbestos region. The average recovery of commercial asbestos from the rock taken out of the mines is six per cent, so that 94 per cent of the mined rock eventually goes to the making of these large dumps. No commercial value has as yet been found for this refuse.

(Concluded from page 21)

the Bell property at Thetford is owned by the Keasbey & Mattison Company, so that the three largest asbestos manufacturers in the United States have their own source of supply. The Asbestos Corporation, Johnson Company and Nicolet Asbestos Company, being independent, supply the other manufacturers.

At the Quebec Asbestos Corporation, in East Broughton, different methods of mining are carried on. The deepest point of their quarries is 125 feet and the area of the pit covers approximately 10½ acres of the total property owned, consisting of 500 acres. This Corporation uses both steam and electric shovels and locomotives on their property, and hoists about 1,000 tons of rock per day. The rock is of a soft nature.

From the pits the material is elevated through a tunnel 400 feet long to a crusher which handles about 100 tons of rock per hour. This crusher feeds into a storage bin and from there the material is passed through the regular milling operation into a mill of 1,000 tons capacity. From this one property, approximately 40,000 tons of fibre are produced in a year, although no grades higher than the better class of shingle and paper stock are produced.

At the present time the largest storage bin in the world for asbestos ore is being built at Broughton, and when finished it will have a capacity of 150,000 tons. It is interesting to note that the pits have been worked for about 25 years without any noticeable diminution of the veins.



Asbestos Corporation Limited

Some idea of the magnitude of the operations carried on by the Asbestos Corporation Limited may be obtained from the following figures showing the tonnage of rock hoisted at their various mines in one day.

King's Mine.....	7,261 tons
Beaver Mine.....	2,848 "
British Canadian.....	2,660 "
Maple Leaf Mine....	755 "
Vimy Ridge Mine....	610 "
Asbestos Mines.....	955 "
	15,089 tons

The cable-way at the King mine is the largest of its kind in operation. The capacity of the six mills is approximately 11,000 tons of rock per day and about 3,000 tons of barren rock and earth are moved in addition.

At the Maple Leaf and Asbestos Mines, as well as at the Beaver Mine, rock is loaded by electric shovels into cars rather than by hand into boxes as at the King pit. At Vimy Ridge hand loaded boxes are hoisted to cars by cranes.

At British Canadian rock is milled down glory-holes 300 feet deep and loaded through chutes into cars which are hauled by electric locomotives through two miles of underground tunnel.

The Asbestos Corporation Limited controls approximately 30,000 acres and the deepest point in their property is at the King pit, which has reached a depth of 400 feet. The cable-way on this pit being 1,400 feet alone, and the skips on the cable-way are 10 tons and $5\frac{1}{2}$ tons, and as much as 14,000 tons of rock has

been moved in one day at this particular property. The capacity of the King mill is 200 tons of rock per hour and the dryers are three in number—vertical $7 \times 7 \times 51$ feet high.

The Corporation employs about 16,000 H.P. per day and operates two electric shovels of two yards each and four steam shovels of one and a half yards each. Their Primary Crusher weighs 132,000 lbs., size $42'' \times 36''$, with a capacity of 225 tons per hour.

In all the Corporation has six mills with a capacity of 500 tons per hour which are active, and seven inactive mills. Altogether they have twelve electric locomotives, eight steam locomotives, approximately 300 cars and have produced as much as 120,000 tons of fibre in one year.

To give some idea of the life of an asbestos Mine, the King pit has been worked, according to information approximately fifty years, and during the course of a single year over 300,000 tons of rock go to the dump from the pit and 1,300,000 tons of rock are taken out in the course of the year. This pit is 750 feet wide x 1,000 feet long.

The Corporation at its various Mines produces various grades of fibres. Those at Thetford and Black Lake differ to those at Vimy Ridge, the last mentioned of which is more similar to Rhodesian and Russian, and at East Broughton the material produced is more of the slip fibre variety.

There are about 1,500 men employed in normal times at the Asbestos Corporation Limited.

Bell Asbestos Mines

This property which is recognized as one of the richest asbestos mines in the world covers approximately 175 acres, of which the Bell pit alone reaches a depth of 200 feet and roughly covers 25 acres and is approximately 1,000 feet square.

The property is equipped to handle 2,000 tons of rock per day, which rock is hoisted through an incline into cars and the capacity of their crushers is 150 tons per hour. The capacity of the hoist operating through the tunnel is approximately 240 tons per hour and the total length of the tunnel is 1,100 feet.

The Bell property employs two $1\frac{1}{4}$ yard steam shovels, seven steam locomotives and approximately 75 cars. The capacity of their mill is 2,000 tons per day and they have produced as much as 60,000 tons of fibre in a year. They operate three 15 ton capacity locomotive steam cranes, and their mills cover approximately 65,000 square feet. The capacity of their dry rock storage bins is 7,500 tons from which this rock goes to the secondary crusher. They use approximately 1,500 K.W. horse power.

In reading the article re-published herewith a better idea is obtained of the property in question.

Canadian Johns-Manville Company

What is probably the largest Asbestos property in the world is that situated at Asbestos, near the village of Danville, operated by the Canadian Johns-Manville Company.

This pit is practically a true circle in outline having an area of about 80 acres and it will be seen by the photographs in the article published herewith the rock is not hoisted, but taken out of the pit by locomotives in cars.

The Company owns about, 700 acres of land and operates four 4 yard electric shovels, four $2\frac{1}{2}$ yard Model 76 steam shovels and three $1\frac{1}{2}$ yard Model 41 steam shovels—a capacity greater than all the rest of the mines in Canada. They handle about 15,000 to 25,000 tons per 10 hours shift, and the deepest point in the pit is 200 feet—the width and lengths of this pit being 2,100 feet. They operate a crusher weighing about 220,000 lbs., and the capacity is 450 tons per hour, and have moved as much as 1,350,000 tons in one year to the dump.

The pit was first opened in 1887 and the capacity of the mill is 6,000 tons per 20 hour day. They employ one electric locomotive, one motorized car, 20 steam locomotives and over 100 cars, and use 8,000 H.P. steam and electric, and approximately 3,500 carloads are shipped per year.

The Canadian Johns-Manville Company, which is owned by the Johns-Manville Corporation of New York, the last mentioned Company of which operates 13 factories throughout the United States and Europe, has two Asbestos Mines and employs approximately 10,000 people, and manufactures over 1,000 individual products. The business was first started in 1858.

Johnson Asbestos Mines

This Company has lately completed a new mill, which is illustrated in the article herewith, but a few remarks about the property will, no doubt, interest our readers.

The Mill has two units; one of which is equipped, to handle 125 tons of rock an hour and has 36 Collectors, 6 Jumbos, 13 double and 2 single fans, 4 horizontal dryers, one primary gyratory Kennedy crusher 36" x 60" actual opening 120", capacity 500 tons per hour, with a grizzly type feeder, and two secondary Kennedy crushers 8" x 24" are also used, and the entire mill screens are driven with "V" type belts, of which there are 700 feet used and also about 5,000 feet of conveyor belt. The mill is 204 ft. x 85 ft. 6 in.—six stories high and built of 12" brick and steel.

The collective horse power for one unit is 3,500 with 1,300 H.P. for the second unit, and the primary crusher alone weighs 132,000 lbs., requiring a 150 H.P. gearless motor. The auto power gravity cars are spotted in the pit by oil electric locomotive and the mill has 19 graders direct driven ball bearing, as well as 56 screens, 8 jumbos, each driven by a 50 H.P. motor, one Williams crusher direct connected to a 125 H.P. synchronized motor, and is, no doubt, the most up-to-date asbestos plant ever built in Canada.

The crusher house is 60 ft. x 120 ft. x 60 ft.—the secondary crushers are direct

connected with a 50 H.P. synchronized motor and the dryers are 40 ft. by 66 inches, and are automatic coal feed gear driven with forced and induced draft driven by two 75 H.P. motors. The capacity of the hoist is 30 tons pull, with $1\frac{3}{8}$ " cable on the 8 ft. x 4 ft. drum 1,550 feet of cable are used running 750 feet per minute. The hoist is remote control driven by a 450 H.P. motor, built by the Canadian Ingersoll-Rand Company at a cost of \$40,000.00. Photographs shown herewith give the reader a good idea of the property.

The deepest point of the pit is about 200 feet with an area of about 400 x 700 feet. The old plant was steam driven by a 150 H.P. Corliss engine and also a high speed 750 H.P. motor. The present horse power used on the property is about 1,500 K.W. The mill capacity of the new mine at Thetford is 120 tons per hour as against the old plant 50 tons, and at their plant at Black Lake 40 tons.

Formerly the Johnson's Company hoisted all their rock, but under the new system they have driven a tunnel over 1,000 feet long x 9 ft. high x 11 ft. wide, and are now using two electric cranes of $3\frac{1}{2}$ tons capacity and are hoisting their rock through this tunnel.

The Johnson's Company are noted for the quantity of crudes obtained in their property, and a visit to this property is well worth while.

Nicolet Asbestos Mines Limited

This property is situated between Asbestos, where the properties of the Canadian Johns-Manville Company are located, and Thetford and Black Lake where the other Mines have their properties.

Nicolet Asbestos Mines are practically newcomers, and own approximately 1,200 acres of surface and mining rights. The plant and equipment is modern in every respect, having only lately been started, and the mining is done by a gasoline driven steam shovel having a capacity of one-and-a-quarter yards. The shovel loads direct into cars in the pits, and these cars are hauled up an incline and dumped into the top of the storage bin over the Crusher, the cars having a capacity of from ten to twelve tons. The hauling is done by means of an electric hoist, and from the rock bin the material is fed into the primary crusher which has a capacity of about one hundred tons per hour. From the primary crusher the rock passes through a second crusher and then through two twin dryers. From the dryers the rock is carried into a further storage bin with a capacity of seven hundred tons, and fed from that storage bin to the mill where it is given a third crushing and subsequent treatment by the usual disintegrating machines, screens, etc.

The main building, that is the mill proper, is three stories high and 120 feet long by 80 feet in width. The property is a producer of Fibres only, and does not enter the market with any Crudes.

Quebec Asbestos Mines

This property is situated at East Broughton and is unique for the quality and percentage of the fibres obtained from the ore. The area of the property is 500 acres and the deepest point in the pit is 125 feet. The pit covers 10½ acres, and measures 1,400 ft. x 450 ft.

The Quebec Asbestos Corporation uses Marion and Quebec electric shovels with a capacity of 1¾ yards each, likewise one steam shovel. They have one electric locomotive, two steam locomotives and hoist 15 ton skips about 1,000 tons of rock per day—these skips carry 7½ tons on hoist or incline. The rock passes through a tunnel 400 feet long x 8 x 14 ft., and from the tunnel passes on to the crusher, 42 x 36, which has a capacity of 100 tons per hour; after which they pass to the storage bin, 50 x 22½ ft. The capacity of the mill is 1,000 tons and the total horsepower used is 1,500.

This Company employs very modern motors up to 300 and 400 H.P. each has two horizontal dryers. The plant machinery is 95% ball bearing. They have produced as much as 40,000 tons of fibre in a year and have lately completed a bin with a storage capacity of 150,000 tons. The mill occupies 100 square feet and 150 men are employed on the property, the pit has been working for 25 years.

Further details on this property are mentioned in the article published herewith.

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